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What is Alzheimer's disease?

A: Alzheimer's disease (pronounced altz'hi-merz) is a little-known but surprisingly common disorder that affects the cells of the brain. It is a disease that produces *intellectual impairment* in 500,000 to 1.5 million American adults. While experts formerly believed that Alzheimer's disease occurred most often in persons under age 65, this disorder is now recognized as the most common cause of severe intellectual impairment in older individuals.

The changes most commonly associated with Alzheimer's disease occur in the *proteins* of the *nerve cells* in the cerebral cortex—the outer layer of the brain—leading to an accumulation of abnormal fibers. Under the ordinary microscope these changes appear as a tangle of *filaments*. These *neurofibrillary tangles* were first described in 1906 by *Alois Alzheimer*, a German neurologist.

New and highly sophisticated instruments and techniques—such as the *electron microscope* which can magnify cells more than a hundred thousand times—have revealed other changes in the brain that are characteristic of the disease. Scattered throughout the cortex, groups of *nerve endings* degenerate and disrupt the passage of *electrochemical signals* between the cells. These areas of degeneration have a special appearance under the microscope and are called *plaques*. The larger the number of plaques and tangles, the greater the disturbance in intellectual function and memory.

What are its symptoms?

A: At first, the individual experiences only minor and almost imperceptible symptoms that are often attributed to emotional upsets or other physical illnesses. Gradually, however, the person becomes more forgetful, particularly about recent events. The individual may neglect to turn off the oven, may misplace things, may recheck to see if a task was done, may take longer to complete a chore that was previously routine, or may repeat already answered questions. As the disease progresses, memory loss increases and other changes, such as confusion, irritability, restlessness, and agitation, are likely to appear in personality, mood, and behavior. Judgment, concentration, orientation, and speech may also be affected. In the most severe cases, the disease may eventually render its victims totally incapable of caring for themselves.

There are many different patterns in the type, severity, and sequence of changes in *mental* and *neurological functioning* that result from Alzheimer's disease. The symptoms are progressive, but there is great variation in the rate of change from person to person. In a few cases, there may be a rapid decline, but more commonly, there may be many months with little change. Limitations in physical activity during the later stages may cause the person to have less resistance to pneumonia and other physical illnesses that may shorten remaining life expectancy by as much as one-half.

Although the person with

Alzheimer's disease may deny or be unaware of the full extent of his or her limitations—especially later in the course of the illness—the inexplicable changes in essential functions are a source of deep frustration for those afflicted and for their loved ones.

How is the diagnosis made?

A: Before a diagnosis of Alzheimer's disease is made, other illnesses which may cause memory loss must be excluded. The condition must be differentiated from the mild and occasional forgetfulness that sometimes occurs during normal aging. Depression, which is fairly common in elderly individuals facing a variety of stressful situations, may also affect memory.

Approximately one-half of elderly men and women with severe intellectual impairment are victims of Alzheimer's disease. About another fourth of the overall group suffer from *vascular disorders*, especially multiple strokes, and the balance have a variety of other conditions; for example, brain tumors, abnormal thyroid function, infections, *pernicious anemia*, adverse drug reactions, and abnormalities in the spinal fluid system (*hydrocephalus*). The specific diagnosis is very important as some causes of mental decline, other than Alzheimer's disease, can be readily treated.

Each person suspected of having Alzheimer's disease should have thorough

physical, neurological, and psychiatric evaluations. *Computerized tomography (CT scan)*, *electroencephalography*, and occasionally special studies of the spinal fluid system are often required for accurate diagnosis. Comprehensive blood studies, including tests for detecting several *metabolic disorders*, must also be carried out as part of the evaluation.

After other diseases have been ruled out, a firm diagnosis of Alzheimer's disease can usually be made on the basis of medical history, mental status, and the course of the illness. The electroencephalogram may show a general slowing of the brain waves and may help confirm the presence of Alzheimer's disease. Periodic neurological examinations and psychological testing are useful in evaluating the progress of the disease.

What causes Alzheimer's disease?

A: Alzheimer's disease is a neurological illness. But why plaques and neurofibrillary tangles develop in the cortex of the brain has not been determined.

It seems clear that Alzheimer's disease is not caused by hardening of the arteries. There is no evidence that it is contagious. Although emotional upsets and stress may temporarily affect the person's mood and behavior, they do not cause the disease.

Alzheimer's disease occurs in 2 to 3 percent of the general population. The

additional increase in its occurrence within the same family, up to 4 to 8 percent, may represent a slight hereditary disposition or an undetermined environmental factor.

Several scientists are applying the newest knowledge and research techniques in *histology*, *virology*, *immunology*, *toxicology*, and *biochemistry* to the study of human brain tissue removed at autopsy. Although there are now a number of promising clues, the determination of the actual cause of Alzheimer's disease requires further scientific investigation.

What is the treatment for Alzheimer's disease?

A: As yet, physicians do not know how to prevent or how to cure Alzheimer's disease. However, proper medical care can reduce many of its symptoms and sound guidance can assist the person and family in coping with its significant impact on their lives.

It is imperative that the person be under the care of a physician. The physician may be a neurologist, a psychiatrist, or a family physician or internist who can consult with a neurologist. Most important, the physician selected must be willing to devote the time and interest required to closely monitor treatment, and to answer the many questions that are bound to arise during the variable course of the illness in any one individual. A physician will also be needed to treat any other

physical ailments that may further complicate the course of the disease.

Drugs are not the only answer, but judicious use of tranquilizers can lessen agitation, anxiety, and unpredictable behavior. Appropriate medication can also improve sleeping patterns and can be used to treat the depression which often accompanies the illness. Proper nourishment and fluid intake are very important, particularly in the aged, but special diets or supplements are usually not necessary. Carefully guided exercise is of value, and physical therapy can help if difficulties arise in physical functioning.

Activities should be maintained at as close to a normal level as possible. A person should try to continue his or her daily routine, physical activities, and social contacts, and should be encouraged and assisted, if need be, to do a little more than he or she feels can be done. It may be helpful to provide memory aids that assist the individual in day-to-day living: a prominent calendar; lists of daily tasks; written reminders about routine safety measures; and directions to, and labeling of, frequently used items.

Although, in general, it is best to maintain an ordered environment so that a person does not have to continuously learn new things, it is important not to restrict a person from trying something new. For example, an individual with Alzheimer's disease may do very well on a trip when accompanied by a supportive family member or friend.

During the early phases of Alzheimer's disease, the person can most often be cared for by the family at home. When the condition becomes more severe, however, a special setting with profes-

sional staff and full-time care may be required. If needed, such an arrangement can be in the best interests of both the individual and the family.

Understandably, the person afflicted with Alzheimer's disease finds it difficult to comprehend the changes taking place in thinking and behavior. Family and friends will want to know how they can help. There will be questions about the activities the person can engage in with safety, how much encouragement should be given to carry out a familiar activity that has become painfully frustrating, and how to explain the memory loss to neighbors. Such questions can only be answered individually, depending on the person and the particular phase of his or her illness. The physician or an associate—a psychologist, nurse or social worker—can be helpful in meeting this need. Family members may also benefit by sharing their experiences with other families who are facing the same problems through one of several supportive groups which are just now being established across the country.

What is being done to learn more about Alzheimer's disease?

A: Physicians' attitudes towards an illness are shaped by whether or not they believe the illness is widespread, and whether its course can be arrested or reversed. Until recently, Alzheimer's disease was believed to be a rare occurrence,

but new studies have demonstrated a higher prevalence of the disease. Theories are now being formed about its cause—theories that may ultimately contribute to the knowledge needed to halt or even reverse the illness. For example, scientists have recently identified a striking reduction—as much as 90 percent—in a particular *brain enzyme (choline acetyltransferase)* that is involved in the passage of nerve signals. If a deficient chemical process rather than the destruction of cells themselves proves to be involved, then health professionals may ultimately employ restoratives to lessen the symptoms of Alzheimer's disease in much the same way as *Parkinson's disease* is treated with *L-dopa*.

Alzheimer's disease is a very specific and major disease whose cause must be determined before it can be treated and prevented. Recent dramatic advances in medical instrumentation and technology have generated further interest in the diagnosis, treatment, and prevention of Alzheimer's disease. To stimulate new research on Alzheimer's disease, the National Institute on Aging, the National Institute of Neurological and Communicative Disorders and Stroke, and the National Institute of Mental Health have co-sponsored a series of workshop-conferences. In response to this expanding interest, studies are now underway or in the planning stages on a large variety of possible risk factors and on biological abnormalities in the brains of those with Alzheimer's disease. There is still much misinformation and lack of understanding about Alzheimer's disease, however. You can help by learning more about it and sharing the knowledge with others.

GLOSSARY

ALZHEIMER, ALOIS—(1864–1915) a German physician who studied the relationship of changes in the structure of the nervous system to disease, and who first described the changes in the disease that carries his name.

BIOCHEMISTRY—the science that deals with the chemistry of living things.

BRAIN ENZYME—a protein that accelerates a specific chemical reaction in the brain.

CHOLINE ACETYLTRANSFERASE—an enzyme that stimulates the production of acetylcholine, a chemical compound active in the transmission of nerve impulses.

COMPUTERIZED TOMOGRAPHY (CT OR CAT SCAN)—a new diagnostic technique using a computer and X-rays to obtain a highly detailed image of the section of the body being studied.

ELECTROCHEMICAL SIGNAL—the transmission of a nerve impulse by electrical and chemical changes.

ELECTROENCEPHALOGRAPHY (EEG)—the recording of the electric activities of the brain by means of wires placed painlessly on the scalp; useful in detecting tumors, epilepsy, and brain damage.

ELECTRON MICROSCOPE—one in which an electron beam, instead of light, produces a greatly magnified image.

FILAMENT—a delicate fiber or thread of protein found in the brain cells.

HISTOLOGY—the branch of anatomy that deals with the minute structure of cells, tissues, and organs in relation to their function.

HYDROCEPHALUS—a condition characterized by the excessive accumulation of fluid in the cavities of the brain, causing a thinning of the brain; may be present at birth or occur later in life.

IMMUNOLOGY—a science that deals with the processes through which individuals are able to resist, or become sensitive to, a particular disease.

INTELLECTUAL IMPAIRMENT—a diminished capacity to think or understand.

L-DOPA—a chemical similar to one which naturally occurs in the brain and is used as a medicine in the treatment of Parkinson's disease.

MENTAL FUNCTIONING—the normal actions of the mind.

METABOLIC DISORDER—a disturbance in the physical and chemical processes by which chemical compounds in the body are produced, maintained, and transformed into energy.

NERVE CELL—a neuron, the basic unit of the nervous system consisting of a cell body and its threadlike extensions for receiving and transmitting impulses.

NERVE ENDING—the fine branchlike terminations of the extensions that carry impulses away from or toward the body of a nerve cell.

NEUROFIBRILLARY TANGLE—an accumulation of abnormal fibers in the nerve cells in the cerebral cortex.

NEUROLOGICAL FUNCTIONING—the normal activities of the nervous system.

PARKINSON'S DISEASE—a neurological disorder characterized by rhythmical muscular tremors, rigidity of movement, stooped posture, short accelerating steps in walking, and masklike expression.

PERNICIOUS ANEMIA—a blood disorder characterized by a deficiency in red cells thought to result from the failure of the stomach lining to secrete an adequate amount of the factor needed to absorb vitamin B-12; occurs most commonly in later life and may affect the nervous system.

PLAQUES—a localized abnormal area found in the brain of a person with Alzheimer's disease.

PROTEIN—a chemical compound consisting of a long chain of amino acids that contain a special grouping of nitrogen and hydrogen; produced by living cells or obtained as essential components of the diet.

TOXICOLOGY—a science that deals with the action, detection, and treatment of poisonous substances.

VASCULAR DISORDER—abnormal functioning resulting from changes in the blood vessels.

VIROLOGY—a science that deals with viruses and viral diseases.

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